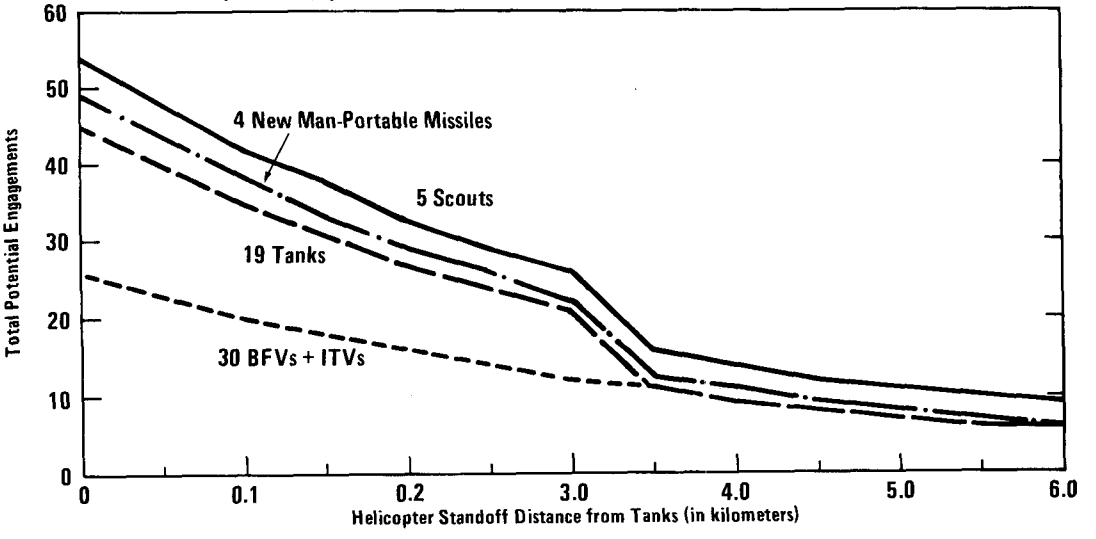
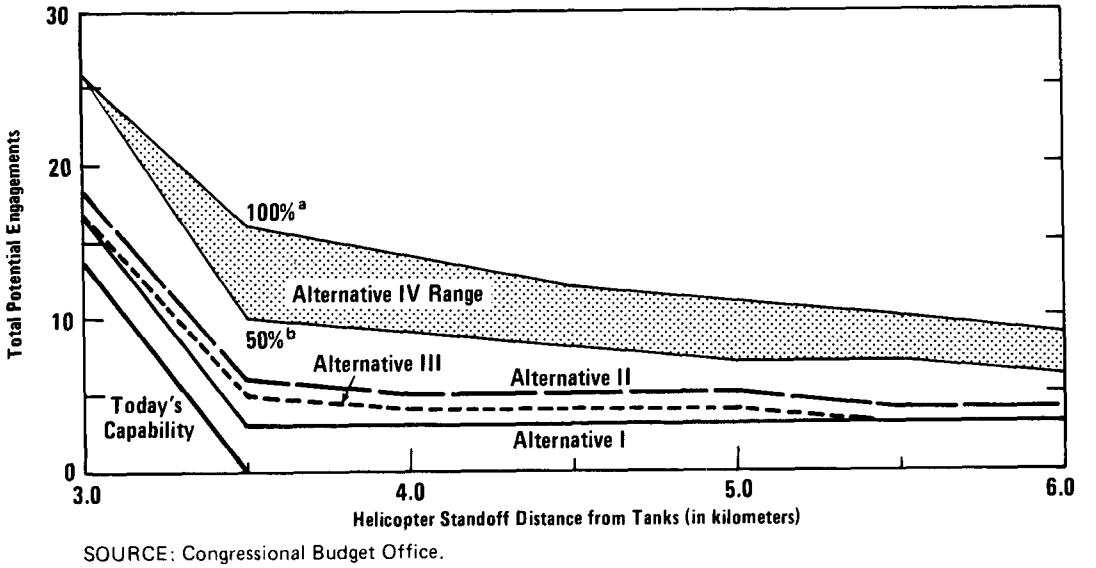
Figure 16.
Potential Engagements of Hovering Helicopters Under Alternative IV (Providing Tanks and Fighting Vehicles with Improved Air Defense Capability)



SOURCE: Congressional Budget Office.
NOTE: Assumes enemy helicopters hover at an altitude of 20 meters.

Figure 17.
Comparison of Potential Engagements of Hovering Helicopters with Today's Weapons and Those Included in Alternatives I, II, III, and IV



SOURCE: Congressional Budget Office.
NOTE: Assumes enemy helicopters hover at an altitude of 20 meters.
[a] All weapons engage helicopters.
[b] One-half of tanks and fighting vehicles engage helicopters.

Cost. The investment cost of achieving such a widespread air defense capability within the Army's maneuver forces could be significant, totaling almost $4 billion with most of the funds required in the next five years and only $0.5 billion required after 1991 (see Table 10). Most of the costs would pay for the purchase of new missiles for the Bradleys and ITVs and for modifying these fighting vehicles to launch the missiles ($2.6 billion). Costs for providing all of the shoulder-fired missile teams with infrared sights could run to $0.7 billion, with another $0.4 billion required to provide the scout helicopters with air-to-air missiles and $0.3 billion for alerting radars. No additional manpower would be needed, however, to implement this alternative; indeed, a savings of about 75 people per division, or 750 people Army-wide, could be realized. Thus, annual operating costs could be reduced by about $13 million.

This alternative would require about $1.9 billion in addition to what the Army has allocated to forward area air defense over the next five years (see Table 10). As in the previous alternative, this amount would represent a doubling in the Army's forward area air defense program, and a 1.9 percent increase in the total Army procurement budget over the next five years. Very little in terms of additional funding--$0.5 billion--would be required beyond 1991, however. (All dollar amounts are in 1987 dollars of budget authority.)

Drawbacks. In this alternative, a task force's ability to defend itself against fixed-wing aircraft would rest solely in the man-portable missile teams and the Chaparral units that would be deployed several kilometers to the rear. This option includes no new dedicated air defense systems, and the tanks and fighting vehicles would probably not be able to attack fast-moving targets.

Furthermore, the same man-portable missile teams provide the only forward area **dedicated** air defense against helicopters. This limitation could result in a lack of forward air defense if battlefield conditions--such as heavy shelling or the use of nuclear or chemical weapons--prevented the unprotected missile teams from performing their mission.

Assigning part of the air defense mission to the fighting vehicles and main battle tanks--a departure from their traditional assignments--could also cause unforeseen problems in training personnel and in command and control. Crews on tanks and fighting vehicles would have to be trained in air defense as well as ground-attack roles. Furthermore, commanders would have to coordinate the air defense activities of some 50 to 60 weapons (rather than the 5 to 13 air defense weapons contained in the battalion today and in other options). The Army's own plans, however, include upgrading the

TABLE 10. COST OF CBO ALTERNATIVES I, II, III, AND IV COMPARED WITH CURRENT ARMY FIVE-YEAR PLAN (By fiscal year, in millions of fiscal year 1987 dollars of budget authority)

	1987	1988	1989	1990	1991	Total 1987-1991	To Complete	Total Cost
Army's Plan a/	38	105	346	561	486	1,535	b/	b/
Alternative I	33	104	117	119	58	430	0	430
Change from Army plan	-5	-1	-229	-442	-428	-1,105	b/	b/
Alternative II	65	241	417	779	680	2,171	985	3,156
Change from Army plan	+61	+136	+71	+216	+194	+836	b/	b/
Alternative III	29	419	735	1,050	989	3,221	1,055	4,276
Change from Army plan	-9	+314	+389	+489	+503	+1,686	b/	b/
Alternative IV	198	552	860	1,002	865	3,468	480	3,948
Change from Army plan	+160	+447	+514	+431	+379	+1,930	b/	b/

SOURCE: Congressional Budget Office.
NOTE: Numbers may not add to totals because of rounding.

a. Includes the Army's program to add air-to-air missiles to 720 scout helicopters and the new Air Defense System, Heavy program--essentially a replacement for DIVAD.
b. These numbers cannot be calculated since a specific Air Defense System, Heavy weapon has not yet been selected.

air defense capabilities of its tanks and fighting vehicles, although probably not on as many vehicles as under this option. 9/ It is possible, therefore, to assume that the Army believes it can surmount whatever organizational or training problems might accompany an increased air defense role for the infantry and amored assets in the divison. Aside from these important but unquantifiable drawbacks, this alternative would provide the air defense posture with the greatest potential.

CONCLUSIONS

The various alternatives considered in this chapter would provide varying improvements to the Army's forward air defense at varying costs (see Table 11). The option that upgrades existing systems (Alternative I) would provide the least improvement at the least cost. Alternatives III, II, and IV would provide air defense systems of decreasing sophistication and individual capability but in increasing quantities. Alternative III would equip each division with 36 very capable air defense systems. The result would be slightly greater overall air defense capability than the first alternative, but at the highest investment cost of all the options considered. Alternative II would provide twice as many simpler air defense weapons to each divison. Although individually these simple air defense systems would not be as capable as the systems included in Alternative III, the overall air defense capability of a battalion task force would be greater. Furthermore, the costs associated with Alternative II would be less than those of Alternative III.

Finally, Alternative IV would equip every tank and fighting vehicle within a battalion task force with some ability to defend itself from helicopter attack. The resulting tanks and fighting vehicles would individually be less effective air defense weapons than the systems in Alternative II and III. They would, however, be present in much higher numbers than in any of the other options. As a result, this last alternative would provide the greatest number of potential engagements. The cost for attaining such a widespread capability would fall somewhere between those of Alternatives II and III.

9. See the appendix which outlines the Army's plan to upgrade its forward area air defenses.

TABLE 11. PERFORMANCE AND COST OF FOUR ALTERNATIVES

Alternatives	Potential Engagements a/		Air Defense Units b/		Investment Cost (In billions of 1987 dollars of budget authority)
	1km	5km	Sophistication	Number Per Division	
Today's Capability	40	0	Low	24	N.A.
Improve Current Systems (Alternative I)	45	3	Low	24	0.4
Deploy Many Simple Systems (Alternative II)	44	5	Moderate	72	3.2
Deploy Fewer New Sophisticated Systems (Alternative III)	42	4	High	36	4.3
Provide Tanks and Fighting Vehicles with Air Defense Capability (Alternative IV)	42	7-11	Low	About 700	3.9

SOURCE: Congressional Budget Office.

NOTE: Numbers may not add to totals because of rounding.

a. At specified helicopter standoff range.
b. Forward Ground-Based Systems Excluding shoulder-fired (man-portable) missiles.


APPENDIX


APPENDIX

THE ARMY'S PLAN FOR FORWARD AREA AIR DEFENSE

In the wake of the DIVAD cancellation in August 1985, the Army initiated a study to determine the best way to improve the air defense of the forward areas of its divisions. As a result of the insights gained from the study, the Army has developed a five-part plan to provide the requisite air defense. The plan includes (1) improving the command and control of the various air defense assets within the division; (2) developing and fielding a missile system that can destroy enemy aircraft that are hidden by trees, hills, or buildings (a Non-Line-of-Sight System); (3) fielding a new air defense system for the rear half of the forward area, about 5 to 15 km from the front line; (4) fielding a new air defense system for protection of the manuever elements (a DIVAD replacement); and (5) upgrading the air defense capability of the tanks and fighting vehicles within the division.

Improved Communication. Communication among various air defense assets in the division is now very poor. The first item of the plan is designed to improve information sharing among the division's various air defense assets. In this way, all air defense systems could be alerted to the presence of air attackers earlier than is currently possible. A possible component of this part of the overall plan would be development and deployment of new early warning sensors, both airborne and ground-based. The total estimated cost in current dollars of this portion of the plan, as presented in hearings before Congress, is $2.5 billion, $0.7 billion of which is for development. The program, as defined now, would provide each of the Army's 18 active divisions with six early warning sensors.

Non-Line-of-Sight System. Helicopters that can attack targets without allowing themselves to be seen by the target may be a significant threat in the future. This portion of the plan would develop and field a system capable of attacking aircraft that it cannot see. It would, therefore, be dependent to some extent on execution of the first part of the overall plan, since any weapon system designed to attack a target that it cannot see must have a general idea of the target's location. Thus, some other system, such as the airborne sensor mentioned above, would be needed to find the target in the first place. Assuming that some means is available for determining general target location, this non-line-of-sight system is designed to fly to the general area of the target and then by means of a sensor (TV or radar) in the missile's nose, find the target and destroy it. The

Army's current candidate for this mission is a fiber optically guided missile (FOG-M) with a TV in its nose that broadcasts what it sees back to the launching platform through a fiber optic cable. The funding currently planned over the next five years for this program is $0.8 billion in current dollars ($0.7 billion in fiscal year 1987 dollars). The Army admits, however, that this is not enough to procure the 18 units per division that the Army ultimately plans to field.

Rear Area System. Army units not immediately on the front line also need defense against air attack. The third part of the program will develop and field a Stinger missile launcher mounted on a truck as a replacement for Chaparral. Because Pedestal Mounted Stinger (PMS), as this system is called, is not sturdy enough to be deployed close to the front, it will remain in the rear half of the forward area. The Army plans to spend slightly over $4.8 billion in current dollars to procure enough PMS vehicles to field 36 per heavy division and to buy the accompanying Stinger missiles.

Forward Area System. Defense of units along the front, the ones most exposed to enemy air attack, is a major goal of the Army's air defense plan. The program for the forward area system, referred to as "Air Defense System, Heavy," (ADS, H) most closely corresponds to the former DIVAD program. It is designed to field quickly 36 air defense systems per division for protection of the maneuver elements. Although the Army has not yet decided on a specific system, it has outlined general requirements for the system, such as initial deliveries in 1989, range sufficient to counter the standoff helicopter threat (about eight km), and a mixture of guns and missiles. This last requirement is not specific as to whether guns and missiles must be on the same platform, a combination of platforms, or in conjunction with the guns on the tanks and fighting vehicles. The Army has $1.5 billion in current dollars--$1.4 billion in fiscal year 1987 dollars--earmarked as part of a program to field a new system to defend the maneuver elements of the heavy divisions.

Upgrade Division Tanks, Fighting Vehicles, and Scout Helicopters. Finally, the Army's program would improve the air defense capability of some of the other systems within the division. This upgrading is desirable because they form the bulk of the weapons in the division. Prime candidates for such improvements would be the M1 tank, by developing an antihelicopter round and the Bradley Fighting Vehicle, by modifying its fire control system to accommodate aerial targets.